From:	BAYUK Dana
To:	Sheldrake, Sean
Cc:	Scott Coffey; LARSEN Henning; Lance Peterson (PetersonLE@cdmsmith.com)
Subject:	NW Natural, HC&C System Transducer Data Evaluation
Date:	Thursday, October 20, 2016 3:52:34 PM
Attachments:	Gasco_HC&C_System_Transducer_Evaluation.xlsx

Good afternoon Sean.

This e-mail provides the highlights DEQ's evaluation of HC&C system transducer data, including an attached spreadsheet summarizing DEQ's data evaluation.

Henning and I would like to distract you from the harbor for a little while to discuss our conclusions with you, Lance, and Scott early next week. Besides discussing our conclusions below and explaining the attachment, we'd also like to discuss aspects of the system that we believe warrant closer monitoring going forward. This topic will cover locations DEQ has preliminarily identified, and any recommendations you'd like to add.

We're available after 10a on Monday (10/24), between 10a and 330p on Tuesday (10/25), and Wednesday (10/26) after 10a. If you're available during the times indicated I'd appreciate a follow-up invite and we can confirm.

Based on analysis of the differences between monthly manual measurements and transducer data at monitoring wells and piezometers in the HC&C system over a 13-month time period (May 2015 through May 2016), DEQ concludes the following:

- The performance criterion for determining hydraulic control and containment at each installation should be increased from 0.05-feet to 0.1-feet to account for river transducer error (i.e., the water levels in monitoring wells or piezometers should be a minimum of 0.1-feet lower than the river to account for total measurement error);
- The highest priority measuring points for confirming and maintaining data accuracy within the system are as follows:
    - The most critical measuring points in the system are the transducers in the river, and additional QA/QC protocols should be implemented at these locations to assure data accuracy (e.g., installation of redundant transducers [if feasible given PLC considerations]);
    - Control wells are the next most critical component(s) of the system and transducers data checks should be performed more frequently than monthly (e.g., minimum twice weekly basis, selected locations for redundant transducers [if feasible given well-head configuration]); and
    - Monitoring locations that do not consistently meet the performance criterion of 0.1-feet, including but not limited to the monitoring wells in the Deep Lower Alluvium WBZ (to be discussed further during the call).

In addition, DEQ expects NW Natural to include protocols in the HC&C system performance monitoring plan to confirm that overall, over some agreed upon time period (e.g., monthly[?], quarterly[?]), the average sum or the errors will be kept below 0.1-feet at each location.

Hope your day is going well and appreciate you replying with your availability to discuss the transducer data evaluation.

Thanks much and let me know if you have questions prior to the call.

Dana

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